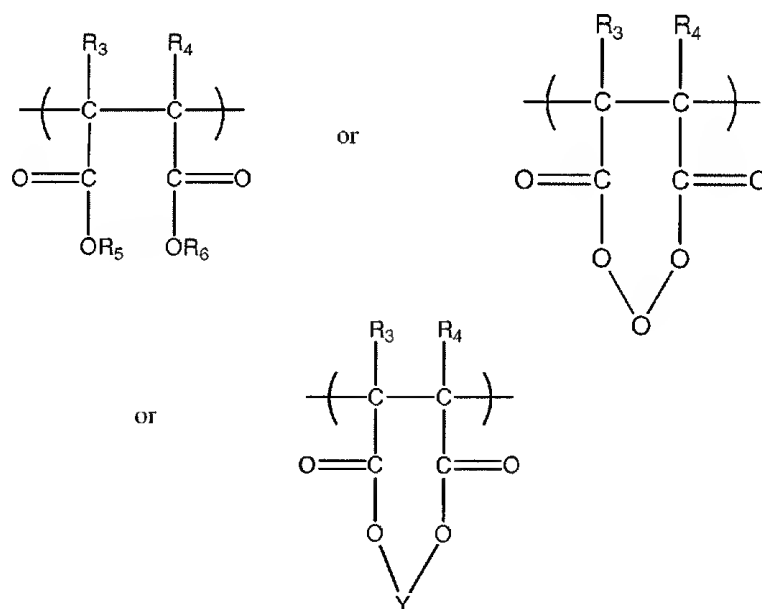
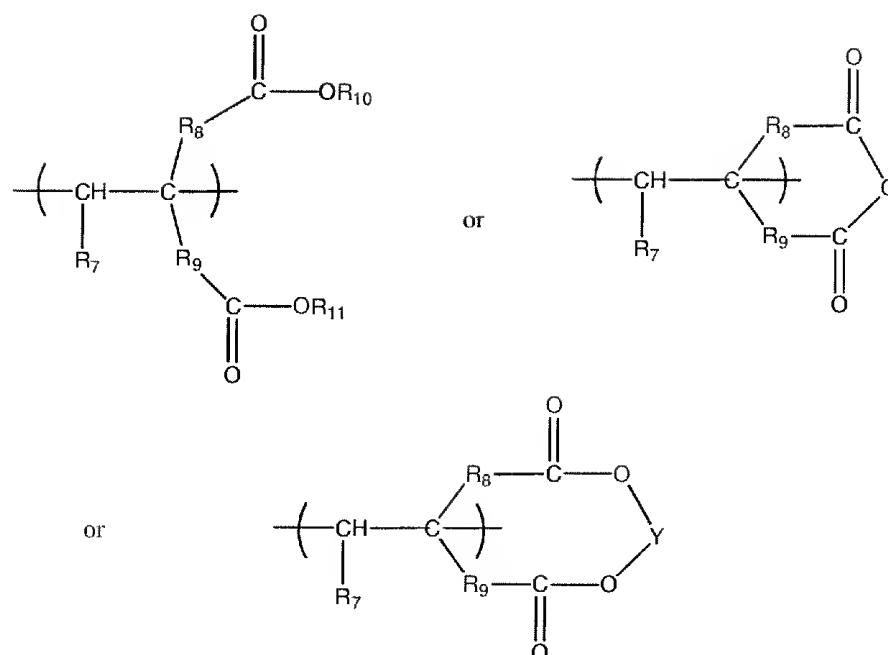


Claims

- [c1] 1.A method of enhancing the growth of plants comprising the step of applying to said plants, seeds of said plants, or the earth adjacent said plants a growth-enhancing amount of a composition comprising a substantially water-soluble polymer in intimate mixture with a fertilizer, said polymer comprising recurring subunits polymeric subunits each made up of at least two different moieties individually and respectively taken from the group consisting of B, and C moieties, or recurring C moieties, where moiety B is of the general formula



and moiety C is of the general formula



wherein each R_7 is individually and respectively selected from the group consisting of H, OH, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl based ester groups, $\text{R}'\text{CO}_2$ groups, OR' groups and COOX groups, wherein R' is selected from the group consisting of C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H, the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from the group consisting of H, the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, Y is selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca, and R_8 and R_9 are individually and respectively

selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein, and said polymer in its polymerized form being at least partially ethylenically saturated.

[c2] 2.The method of claim 1, said polymer being applied at a level of from about 0.001 lbs. to about 100 lbs. polymer per acre of said growing plants.

[c3] 3.The method of claim 1, said polymer being in liquid dispersion.

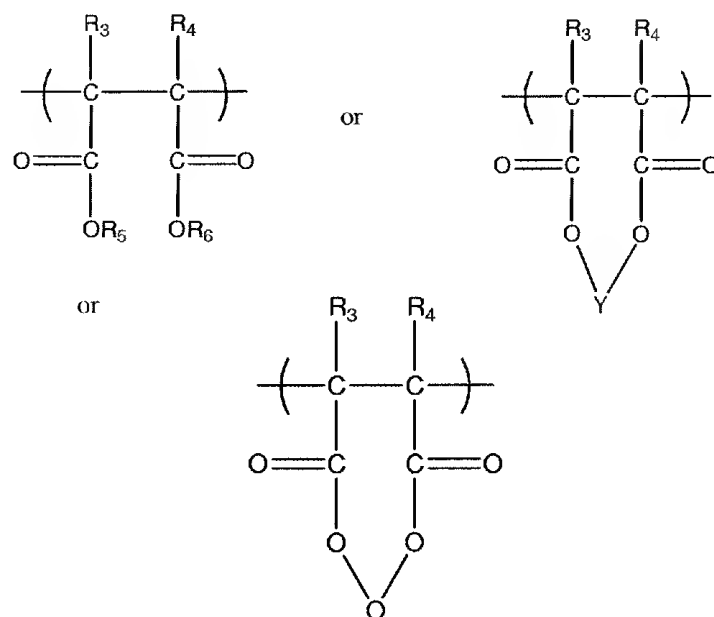
[c4] 4.The method of claim 1, said polymer being in granular form.

[c5] 5.The method of claim 1, said fertilizer being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients.

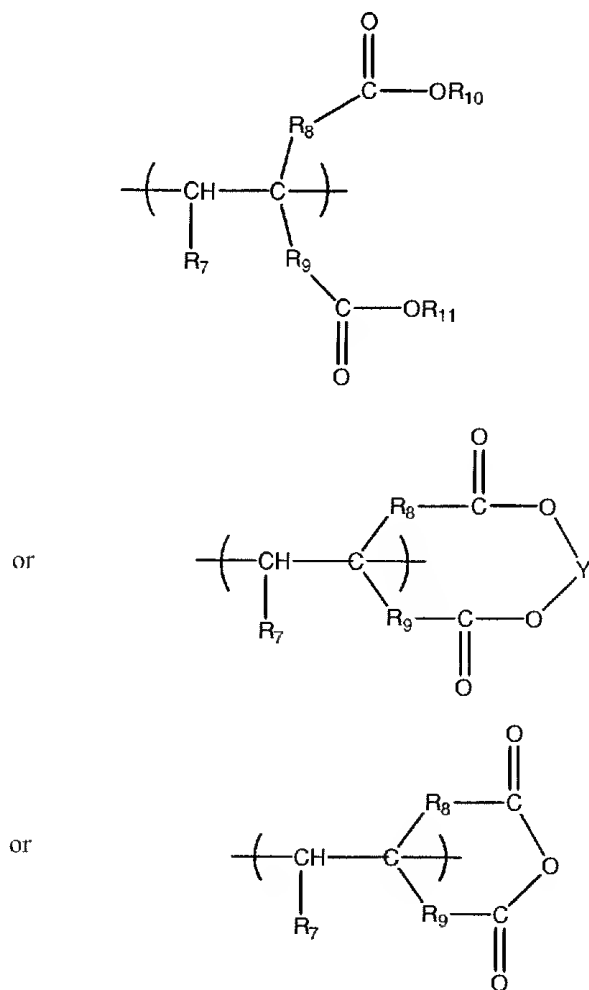
[c6] 6.The method of claim 1, said polymer and fertilizer being co-ground together.

- [c7] 7.The method of claim 1, said polymer being applied to the surface of said fertilizer.
- [c8] 8.The method of claim 1, said fertilizer being in the form of particles having an average diameter of from about powder size to about 10 cm.
- [c9] 9.The method of claim 1, said polymer being present with said fertilizer product at a level of from about 0.001 g to about 20 g polymer per 100 g fertilizer.
- [c10] 10.The method of claim 1, said polymer being complexed with an ion.
- [c11] 11.The method of claim 10, said ion being selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca.
- [c12] 12.The method of claim 1, said polymer being applied at a rate of at least 5 ppm.
- [c13] 13. The method of claim 1, said composition substantially coating the surface of said seeds.
- [c14] 14.A method of decreasing fertilizer dust comprising the step of coating fertilizer with a composition comprising a fertilizer product and a substantially water-soluble dicarboxylic acid polymer having recurring polymeric subunits each made up of at least two different moieties in-

dividually and respectively taken from the group consisting of B and C moieties, or recurring C moieties, wherein moiety B is of the general formula



and moiety C is of the general formula

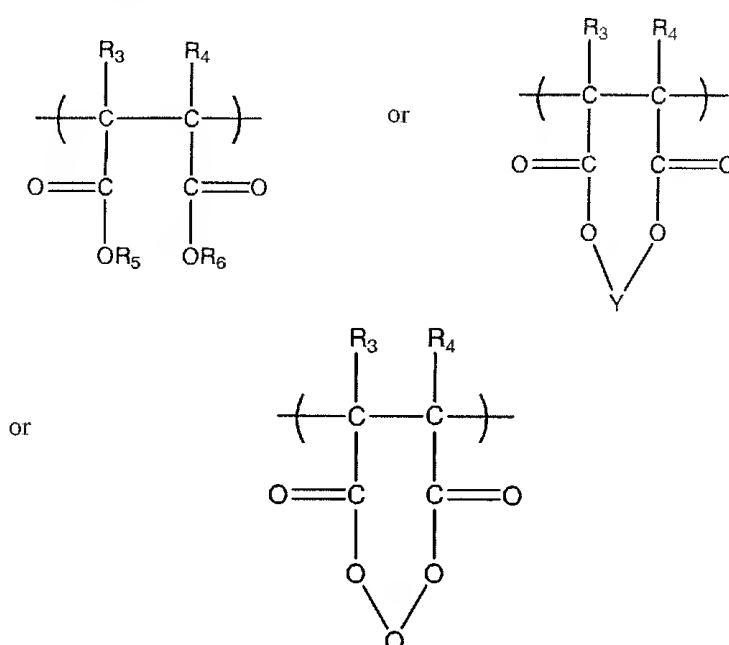


wherein each R_7 is individually and respectively selected

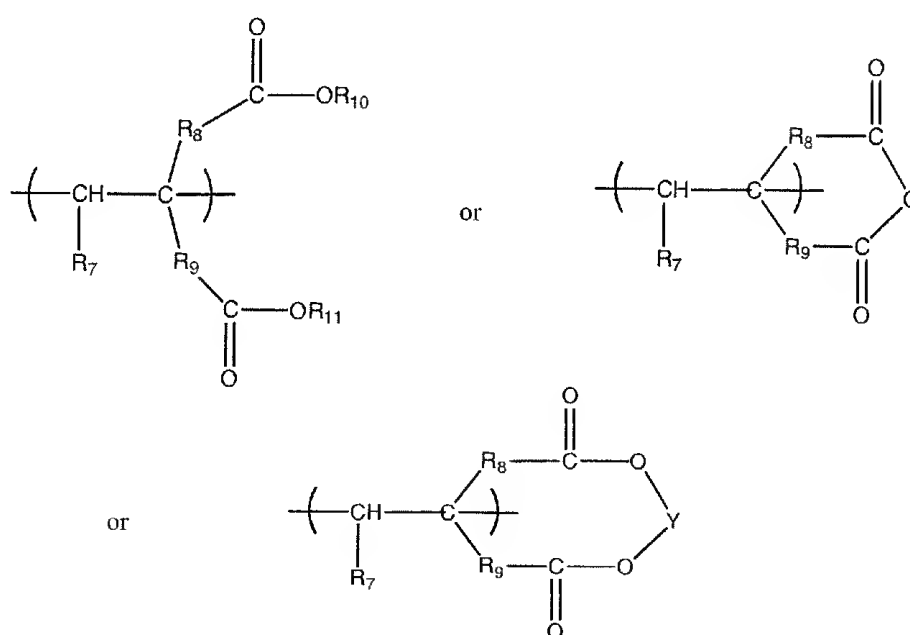
from the group consisting of H, OH, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl based ester groups, $R'CO_2$ groups, OR' groups and $COOX$ groups, wherein R' is selected from the group consisting of C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H, the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H, C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from the group consisting of H, the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, Y is selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca, and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein, and said polymer in its polymerized form being at least partially ethylenically saturated.

[c15] 15.A composition for enhancing plant growth comprising a fertilizer product and a substantially water-soluble dicarboxylic acid polymer having recurring polymeric sub-

units each made up of at least two different moieties individually and respectively taken from the group consisting of B and C moieties, or recurring C moieties, wherein moiety B is of the general formula



and moiety C is of the general formula



wherein each R_7 is individually and respectively selected from the group consisting of H, OH, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl groups, $\text{C}_1\text{--C}_{30}$ straight, branched chain and cyclic alkyl or aryl based

ester groups, $R'CO_2$ groups, OR' groups and $COOX$ groups, wherein R' is selected from the group consisting of C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups and X is selected from the group consisting of H , the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, R_3 and R_4 are individually and respectively selected from the group consisting of H , C_1-C_{30} straight, branched chain and cyclic alkyl or aryl groups, R_5 , R_6 , R_{10} and R_{11} are individually and respectively selected from the group consisting of H , the alkali metals, NH_4 and the C_1-C_4 alkyl ammonium groups, Y is selected from the group consisting of Fe , Mn , Mg , Zn , Cu , Ni , Co , Mo , V and Ca , and R_8 and R_9 are individually and respectively selected from the group consisting of nothing (i.e., the groups are non-existent), CH_2 , C_2H_4 , and C_3H_6 , each of said moieties having or being modified to have a total of two COO groups therein, and said polymer in its polymerized form being at least partially ethylenically saturated.

- [c16] 16. The composition of claim 15, wherein R_3-R_4 are respectively and individually selected from the group consisting of H , OH and C_1-C_4 straight and branched chain alkyl groups, R_5 , R_6 and X are individually and respectively selected from the group consisting of the alkali metals.

- [c17] 17.The composition of claim 15, said polymer being complexed with an ion.
- [c18] 18.The composition of claim 17, said ion being selected from the group consisting of Fe, Mn, Mg, Zn, Cu, Ni, Co, Mo, V and Ca.
- [c19] 19.The composition of claim 15, said polymer being in a form selected from the group consisting of a liquid dispersion or a granular form.
- [c20] 20.The composition of claim 15, said fertilizer being selected from the group consisting of phosphate-based fertilizers, organic wastes, waste waters, fertilizers containing nitrogen, phosphorous, potassium calcium, magnesium, sulfur, boron, or molybdenum materials, fertilizers containing micronutrients, and oxides, sulfates, chlorides, and chelates of such micronutrients.
- [c21] 21.The composition of claim 15, said polymer and fertilizer being co-ground together.
- [c22] 22.The composition of claim 15, said polymer being applied to the surface of said fertilizer.
- [c23] 23.The composition of claim 15, said fertilizer being in the form of particles having an average diameter of from about powder size to about 10 cm.

[c24] 24.The composition of claim 15, said polymer being present with said fertilizer product at a level of from about 0.001 g to about 20 g polymer per 100 g fertilizer.

[c25] 25.The composition of claim 15, said polymer being applied at a rate of at least 5 ppm.